Analysing future energy system pathways of East, Central and West China in a global context with TIAM

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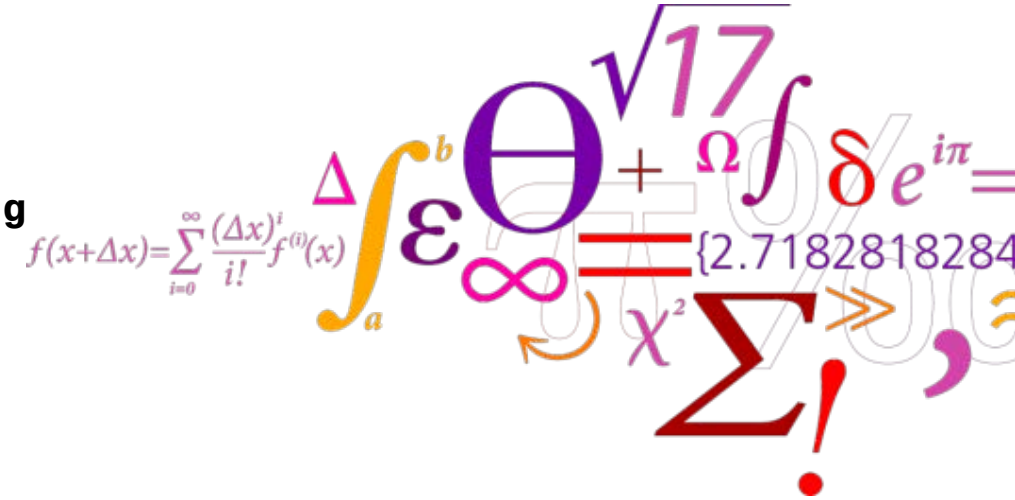

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Added value:
An improved modeling of China´s regional energy characteristics and its global impacts in TIAM

- China is at the centre of an unprecedented shift in the global economy and the global energy industry. Over the past decades China has experienced fast economic growth, accompanied by rapid urbanization, increasing energy consumption, widening regional disparities and soaring green house gas emissions.

- This remarkable growth has led to twin challenges for China: (i) improving environmental sustainability and regional economic development and (ii) enhancing energy security.

- Any major effort to minimize, mitigate and adapt to the adverse effects of climate change will need to better understand and integrate China´s future energy system pathways and related policy targets.

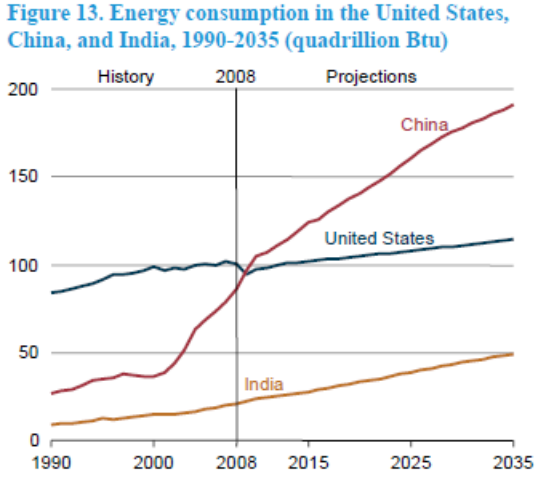
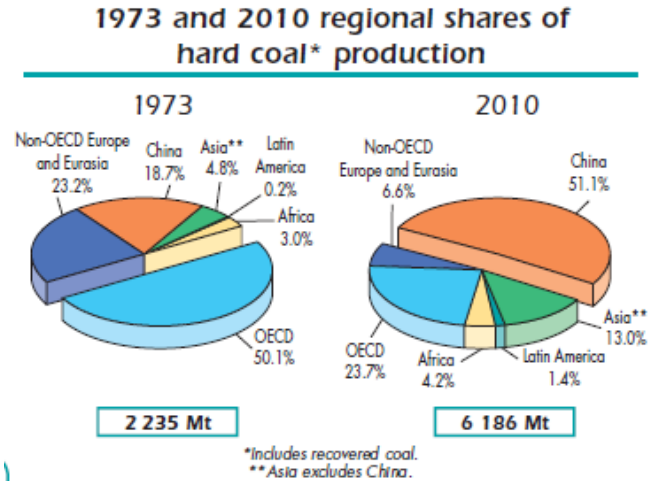


Figure 13. Energy consumption in the United States, China, and India, 1990-2035 (quadrillion Btu)

Sources:

Figure 13 from US EIA global outlook 2011 – China is the top energy consuming country

Regional shares of hard coal production, global from IEA Key World Energy statistics 2011 – China is the top hard coal producing country in 2010



The data challenge:
How to deal with energy statistics full of Chinese characteristics in an international context?

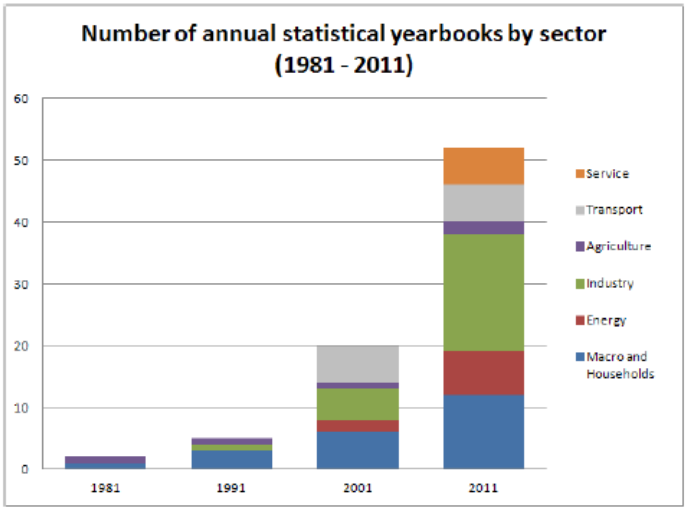


Figure 1: Increase of national statistical yearbooks in China (1981-2011)

Development of a simplified methodology to integrate selected indicators from Chinese national statistics in TIAM to distinguish energy systems for East, Central and West China – based on the IEA energy balance methodology (as used for other regions in TIAM)

Source:

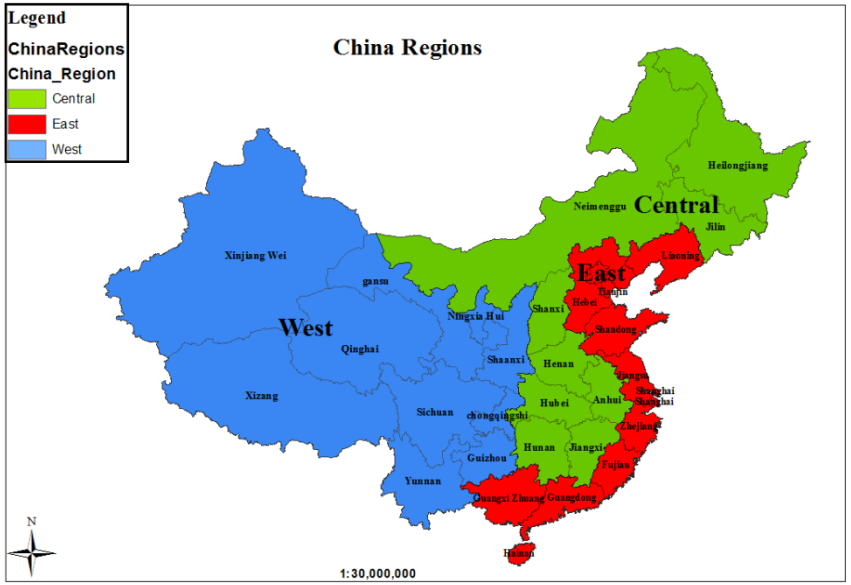
Mischke, Peggy (2013): China's energy statistics in a global context: A methodology to develop regional energy balances for East, Central and West China. MPRA DTU Working Paper 50145; published on October 1, 2013; 44 pages; http://mpra.ub.uni-muenchen.de/id/eprint/50305

Using TIAM to represent key characteristics of China's regional energy systems – Defining East, Central and West China in TIAM

- The suggested sub-regional definition of China in TIAM is based on the PRC's Seventh Five-Year Plan (1986–1990), which grouped all provincial level divisions of China into three economic zones in order to promote medium to long term economic specialization and division of labour.

  → **18 Region global model version of TIAM**, based on 15 Region global TIAM 2011 version

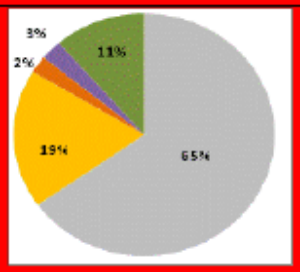
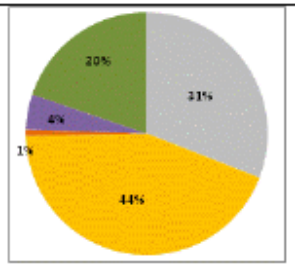
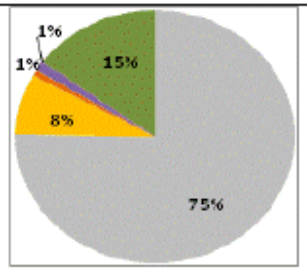
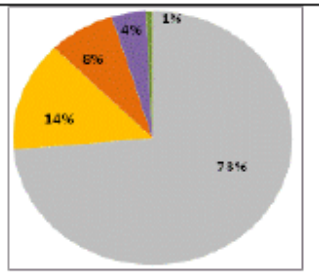
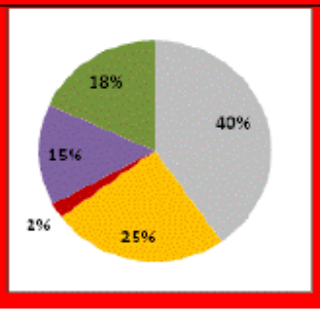
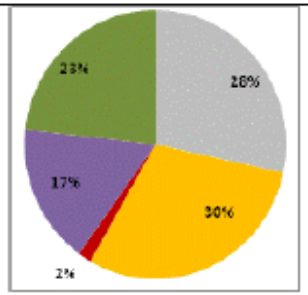
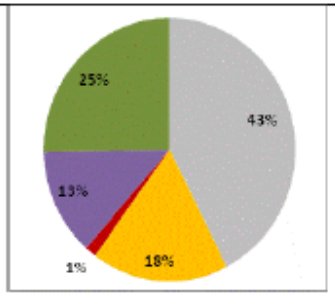
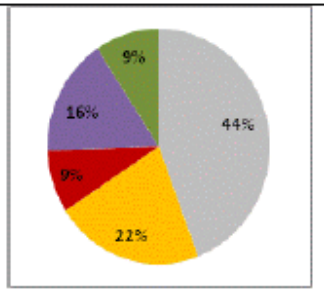
- **China East Region:** export-oriented industries, including steel, chemicals, engineering and textiles; in 2010 about 578 million inhabitants (44% of Chinese population) lived on 13% of China's land area; currently the economic powerhouse, accounting for more than 92% of China's exports and about 97% of China's GDP in 2010
- **China Central Region:** most of China's coal and metallurgical industries, as well as agricultural production; in 2010 about 440 million inhabitants (34% of Chinese population) lived on 29% of China's land area; crucial for supplying energy to the provinces in China's East Region.
- **China West Region:** the least developed region; marginal share of about 1% in China's GDP in 2010; in 2010 about 293 million inhabitants (22% of Chinese population) lived on 57% of China's land area; major hydropower resources



Sources:

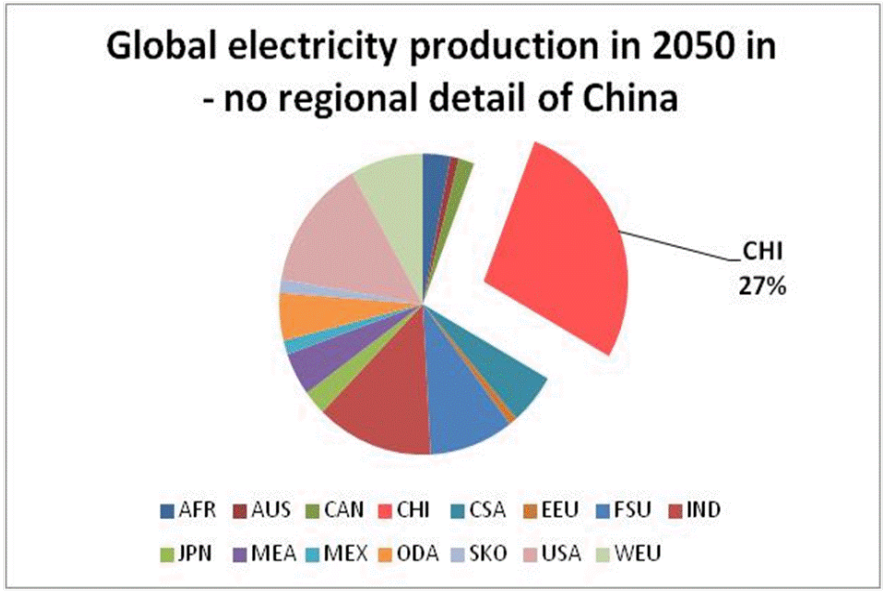
PRC NBS Statistical Yearbook 2011; Economist 2012

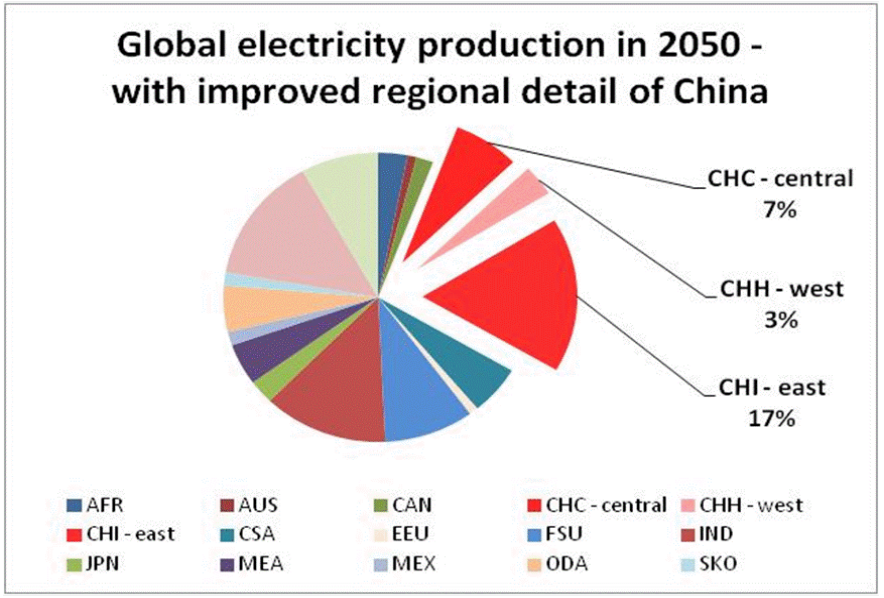
TIAM 18R base year calibration – Fuel mix for primary supply and final consumption

2005 Fuel mix	China National	East China	Central China	West China
Primary energy supply				
Final fuel consumption				

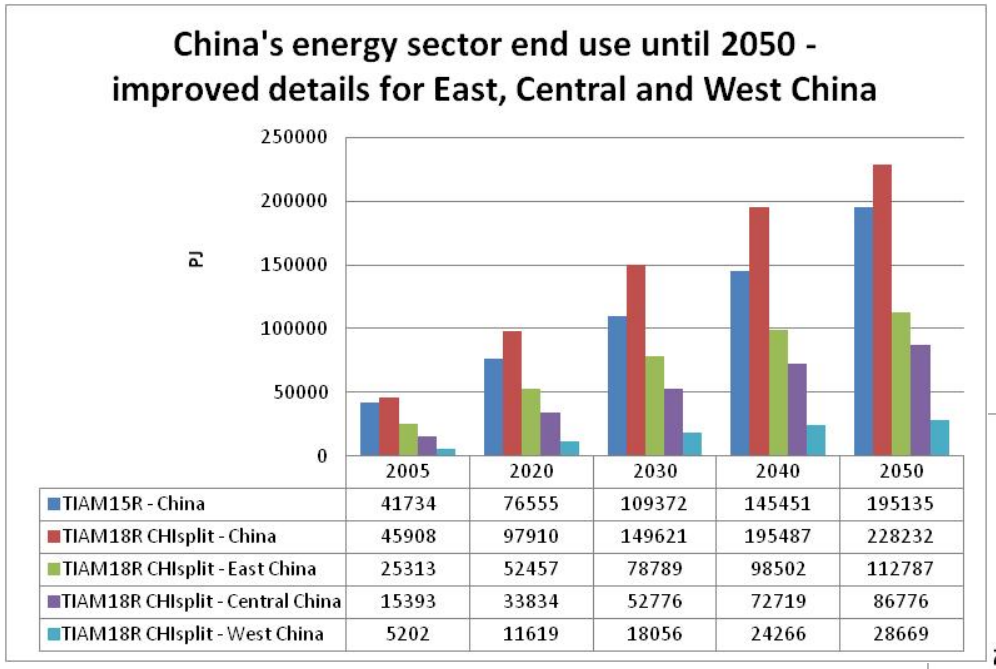
Coal, Coke and other coal products | Oil and petroleum products | Natural Gas and NGL | Electricity | Biomass

Insights from TIAM 18R reference scenario runs (I)
Improved modelling of China's power sector

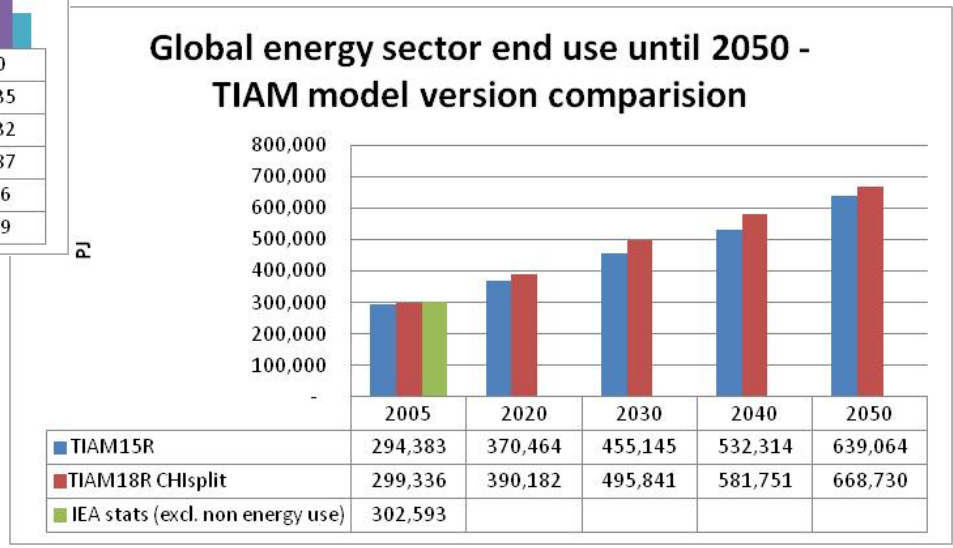




Insights from TIAM 18R reference scenario runs (II)
Energy end use pathways until 2050

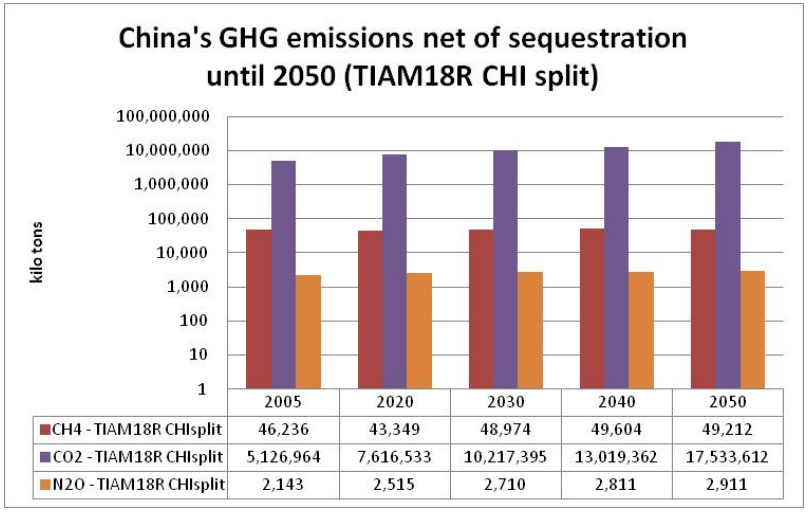


	2005	2020	2030	2040	2050
TIAM15R - China	41734	76555	109372	145451	195135
TIAM18R CHIsplit - China	45908	97910	149621	195487	228232
TIAM18R CHIsplit - East China	25313	52457	78789	98502	112787
TIAM18R CHIsplit - Central China	15393	33834	52776	72719	86776
TIAM18R CHIsplit - West China	5202	11619	18056	24266	28669

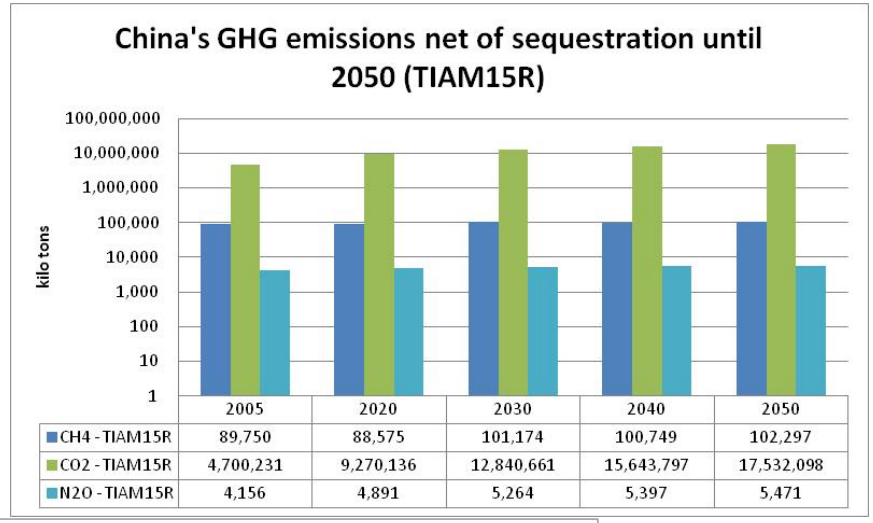


	2005	2020	2030	2040	2050
TIAM15R	294,383	370,464	455,145	532,314	639,064
TIAM18R CHIsplit	299,336	390,182	495,841	581,751	668,730
IEA stats (excl. non energy use)	302,593				

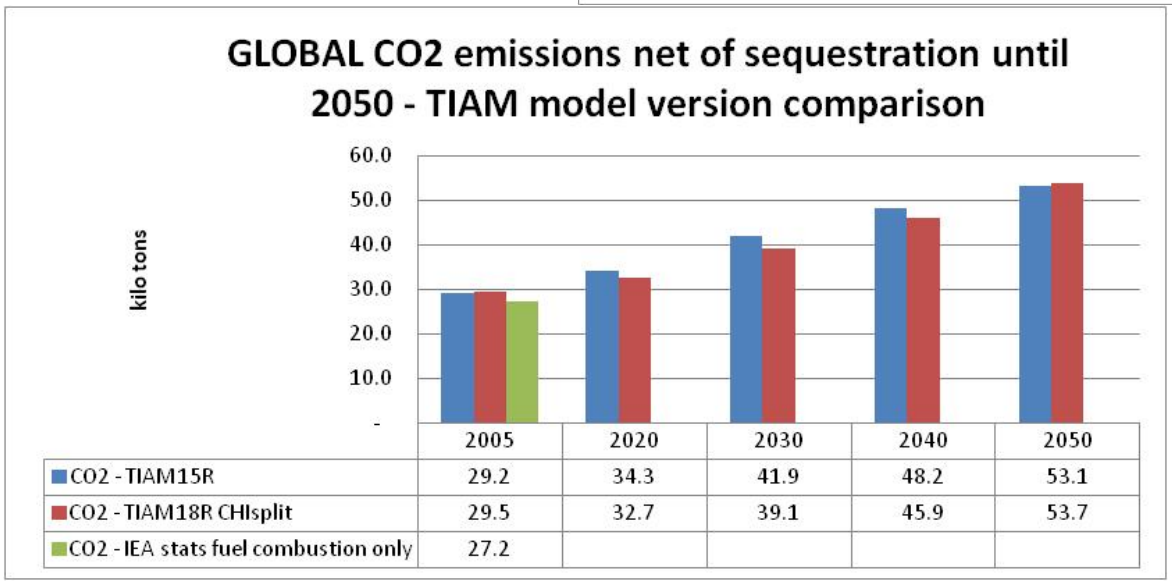
Insights from TIAM 18R reference scenario runs (III)
Future emission pathways until 2050



	2005	2020	2030	2040	2050
CH4 - TIAM18R CHIsplit	46,236	43,349	48,974	49,604	49,212
CO2 - TIAM18R CHIsplit	5,126,964	7,616,533	10,217,395	13,019,362	17,533,612
N2O - TIAM18R CHIsplit	2,143	2,515	2,710	2,811	2,911



	2005	2020	2030	2040	2050
CH4 - TIAM15R	89,750	88,575	101,174	100,749	102,297
CO2 - TIAM15R	4,700,231	9,270,136	12,840,661	15,643,797	17,532,098
N2O - TIAM15R	4,156	4,891	5,264	5,397	5,471



	2005	2020	2030	2040	2050
CO2 - TIAM15R	29.2	34.3	41.9	48.2	53.1
CO2 - TIAM18R CHIsplit	29.5	32.7	39.1	45.9	53.7
CO2 - IEA stats fuel combustion only	27.2				

Thank You!谢谢!
Danke! Merci bcp! Gracias!

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